PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PU030308	FOR FURTHER ACTION	See Form PCT/IPEA/416

International application No. PCT/US2004/041164	International filing date *(day/month/year)* 01.12.2004	Priority date *(day/month/year)* 05.12.2003

International Patent Classification (IPC) or national classification and IPC
H04N7/26, H04N5/262

Applicant
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1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

    a. ☒ *sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:

        ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

        ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

    b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

    ☒ Box No. I   Basis of the opinion

    ☐ Box No. II   Priority

    ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

    ☐ Box No. IV   Lack of unity of invention

    ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

    ☐ Box No. VI   Certain documents cited

    ☐ Box No. VII   Certain defects in the international application

    ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand 20.06.2005	Date of completion of this report 01.03.2006

Name and mailing address of the international preliminary examining authority: European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	Authorized Officer Heising, G Telephone No. +49 30 25901-407

Box No. I   Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))
   ☐ publication of the international application (under Rule 12.4)
   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

   Description, Pages

   1-11   as originally filed

   Claims, Numbers

   1-17   filed with telefax on 20.06.2005

   Drawings, Sheets

   1/2, 2/2   received on 09.03.2005 with letter of 31.01.2005

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   ☐ the description, pages
   ☐ the claims, Nos.
   ☐ the drawings, sheets/figs
   ☐ the sequence listing *(specify)*:
   ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   ☐ the description, pages
   ☐ the claims, Nos.
   ☐ the drawings, sheets/figs
   ☐ the sequence listing *(specify)*:
   ☐ any table(s) related to sequence listing *(specify)*:

   * If item 4 applies, some or all of these sheets may be marked "superseded."

Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10,13-17
	No:	Claims	11,12
Inventive step (IS)	Yes:	Claims	1-5,7-10
	No:	Claims	6,11-17
Industrial applicability (IA)	Yes:	Claims	1-17
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V.

1   Reference is made to the following documents:

D1 : WO 97/22204 A (PRZYBORSKI, GLENN, B; GIBSON, ROBERT, F; HARN, JOHN, H; HUCKE, LLOYD,) 19 June 1997 (1997-06-19)

D2 : CHRISTINA GOMILA: "SEI message for film grain encoding: syntax and results" JVT OF ISO IEC MPEG AND ITU-T VCEG JVT-I013 REVISION 2, 2 September 2003 (2003-09-02), pages 1-11, XP002308743 SAN DIEGO, CA, USA

D3: SCHLOCKERMANN M ET AL: "Film grain coding in H.264/AVC" JOINT VIDEO TEAM (JVT) OF ISO/IEC MPEG & ITU-T VCEG (ISO/IEC JTC1/SC29/WG11 AND ITU-T SG16 Q6), 2 September 2003 (2003-09-02), pages 1-8, XP002311238 SAN DIEGO, CA, USA

D4: CHRISTINA GOMILA, ALEXANDER KOBILANSKY: "SEI message for film grain encoding" JVT OF ISO IEC MPEG AND ITU-T VCEG JVT-H022, 23 May 2003 (2003-05-23), pages 1-14, XP002308742 GENEVA, SWITZERLAND

D5: US-A-5 641 596 (GRAY ET AL) 24 June 1997 (1997-06-24)

2   INDEPENDENT CLAIM 11

The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of claim 11 is not new in the sense of Article 33(2) PCT.

In claim 11 protection is sought for *a data carrier containing film grain blocks established in accordance with the method of claim 7 for blending with video information carried by the data carrier.*

D3 discloses storing film grain macroblocks in a video bitstream or in a SEI message for blending with the video in the bitstream (D3: page 1, lines 10-14 in the introduction). According to D3: page 4, paragraph 2, the bitstream may be stored on a DVD. The method steps of claim 7 describing the generation of the film grain are not features of claim 11, but they may characterise the product, i.e. the generated film grain noise. The question is whether the claimed grain blocks can be distinguished from other noise blocks, such as the blocks mentioned in D3.

According to claim 7
the grain blocks shall reflect received film grain information, but the kind of information is not given,
blocks can be of any size,
the grain is produced by using a pseudo-random number, but neither the generator function and the seed is given nor the type of grain noise, such as Gaussian noise or the like,
scaling of grain values is performed, but this does not characterise the output, since neither the input nor the kind of scaling is known,
and generated blocks are stored in a pool, but therefrom only the storing of the noise can be derived.

Thus, there are no features characterising the grain in such a way that it can be distinguished from many other noise signals, such as the grain blocks in D3.
Therefore, the subject matter of claim 11 is not new over D3.

3   INDEPENDENT CLAIM 6
The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of claim 6 does not involve an inventive step in the sense of Article 33(3) PCT.

3.1   Document D1, which is considered to represent the most relevant state of the art to the subject matter of claim 6, discloses (the references in parentheses applying to this document):

A method for simulating film grain in an image block of pixels, comprising the steps of:
(D1: abstract, lines 4-5, and page 22, lines 9-11)
randomly selecting a block of film grain from a pool of pre-established film grain blocks
(D1: page 21, line 26 - page 22, line 11, and figure 9)
blending at least a portion of the deblocked film grain block with each pixel of the

image block to simulate film grain.
(D1: page 22, lines 21-24)

3.2   The subject-matter of independent claim 6 differs from the disclosure of D1 in that the steps:
1) selecting from a pool of pre-established film grain blocks for a luma value corresponding to a luma characteristic of the image block;
2) deblocking the selected film grain block;
3) clipping the resultant blended pixels prior to output.
are missing in D1.

3.3   The problem to be solved by the present invention may therefore be regarded as

How to improve the visual video quality of a video blended with film grain noise.

3.4   In view of D2 the solution proposed in claim 6 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The skilled person in the field of film grain post processing knows that film grain noise originating from video acquisition on a celluloid film is image (D2: page 4, paragraph 5) and film stock dependent (D1: page 4, lines 1-25). Thus, he knows that he can improve the visual quality of the blended video of D1 if the grain noise block is well adapted to the input image block and the celluloid film. Since, it is always one objective of the skilled person to improve the visual quality of video the problem as such is known and not inventive. To solve the problem posed D2 suggests to compute the average of the input block (D2: page 3, lines 28-36) and to scale the grain block during generation as a function of the (quantized) average value "s" (D2: page 4, lines 17-30). In D1 the intensity of the grain block is selected via the grain intensity selector 905 (D1: page 22, lines 18-20). As an example for controlling the selection "a multiposition rotary switch" selected by an operator is mentioned (D1: page 22, lines 26-28) thereby indicating that also other possibilities for selection exist. Thus, for the skilled person being confronted with the above given problem it is obvious to combine and he therefore would combine the feature of adapting/selecting

the intensity of the grain depending on the input block luminance which is known from D2 with the manually selected film grain intensity via the grain intensity selector 905 given in D1. Therefore missing feature 1) is obvious.

Furthermore, deblocking of the grain blocks is used in D2 to improve the output video quality (D2: page 4, lines 34-35).

In addition, a person skilled in the art knows that blending two signals can lead to an over- or underflow of the pixel value range.
The feature of clipping the blended values to a given output range is therefore merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

3.5 Therefore, the features disclosed in D1 and D2 would be combined by the skilled person to arrive at the method of claim 6, without exercise of any inventive skills, in order to solve the problem posed. The proposed solution in independent claim 6 thus cannot be considered inventive (Article 33(3) PCT).

4   INDEPENDENT CLAIM 13
The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 13 does not involve an inventive step in the sense of Article 33(3) PCT.
Document D1 discloses (the references in parentheses applying to this document) page 21, line 26 - page 22, line 31 with figure 9:

Apparatus for creating a block of M x N pixels, comprising,
a first storage repository for storing a set of previously established M x N pixel blocks containing film grain, where M and N are integers;
(D1: page 22, lines 9-11, figure 9 "EPROM")
a selector for selecting a film grain block of M x N pixels from the first repository as function of a pseudo-random number; and
(D1: page 21, line 26 - page 22, line 11, and figure 9)

*a scaling block for scaling all the pixel values in the selected film grain block in
accordance with at least one parameter of film grain information received by the
scaling block;*
(D1: page 22, lines 18-28, figure 9 "Grain Intensity Selector"; since the type of
parameter of film grain information is not defined in the claim, the chosen position of
the "multiposition rotary switch of selector 905" can also be seen as a parameter of
film grain information which is manually selected by the operator.)

Thus, all features of claim 4 but the following are known from D1:

- *a second storage repository storing the scaling film grain block.*

A person skilled in the art knows that the created blocks in D1 can either be used
directly for blending or can be stored in memory for later use. This is a question of the
available computational and memory resources.
For example, in D3 grain blocks and in D5 grain parameters are pre-calculated and
stored in memory for later use.

This feature is therefore merely one of several straightforward possibilities from which
the skilled person would select, in accordance with circumstances, without the
exercise of inventive skill, in order to solve the problem posed.

5   INDEPENDENT CLAIM 17
Claim 17 is the corresponding apparatus claim to the method claim 6. It is to be
observed that each means of the apparatus is perfectly matching to one
corresponding technical feature of the corresponding method claim. For the same
reasons as given in section 3 above the corresponding apparatus claim 17 does not
meet the criteria of Article 33(1) PCT, because the subject-matter of claim 17 does
not involve an inventive step in the sense of Article 33(3) PCT.

6   DEPENDENT CLAIMS 12 AND 14-16
Dependent claims 12 and 14-16 do not contain any features which, in combination

with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step (Article 33(2) and (3) PCT), see document D1-D5 and the corresponding passages cited in the search report.

7   CLAIMS 1-5 AND 7-10
The combination of features of claims 1-5 and 7-10 are neither known from, nor rendered obvious by the available prior art.

8   CLAIMS 1-17
Claims 1-17 disclose methods and apparatus for video processing applications to improve the visual quality of the video. Therefore, the subject-matter of these claims is considered to be industrially applicable according to Article 33 (4) PCT.

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CLAIMS

1   1.   A method for creating a block of M x N pixels with film grain for blending
2   with an image to simulate film grain, where N and M are integers greater than zero,
3   comprising the steps of:
4   receiving film grain information that includes at least one parameter that specifies an
5   attribute of the film grain to appear in the image block;
6   deriving the non transmitted parameters based on pre-established default values;
7   selecting a film grain block of M x N pixels from among a set of previously
8   established blocks containing film grain as a function of a pseudo-random number and at least
9   one parameter characterizing the film grain; and
10   scaling all the pixel values in the block as indicated by at least one parameter
11   characterizing the film grain; and
12   storing the created block of film grain into a pool of film grain blocks.

1   2.   The method according to claim 1 wherein the selecting step further comprises the
2   step of selecting from among a predetermined number of sets of 4096 values each.

1   3.   The method according to claim 2 wherein each of the predetermined number of
2   sets of values are arranged as a 512 x 8 matrix.

1   4.   The method according to claim 3 wherein the predetermined number of sets of
2   values are stored in 2's complement and range from [-127, 127].

1   5.   The method according to claim 1 further comprising the steps of
2   selecting a film grain block from among the pool of film grain blocks in accordance with
3   a pseudo random number and a luma characteristic of the incoming image;
4   deblocking opposing edges of the selected film grain block; and
5   blending at least a portion of the deblocked selected film grain block with each pixel in
6   the image block; and
7   clipping the image block pixels blended with film grain.

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1   6.   A method for simulating film grain in an image block of pixels, comprising the

2 steps of:

3   randomly selecting a block of film grain from a pool of pre-established film grain blocks

4 for a luma value corresponding to a luma characteristic of the image block;

5   deblocking the selected film grain block;

6 blending at least a portion of the deblocked film grain block with each pixel of the image block to

7 simulate film grain;

8   clipping the resultant blended pixels prior to output.

1   7.   The method according to claim 6 wherein the pool of

2 pre-established film grain blocks is created by the steps of: receiving film grain information

3 that includes at least one parameter that specifies an attribute of the film grain to appear in the

4 image block;

5   selecting a film grain block of M x N pixels from among a set of previously

6 established blocks containing film grain as a function of a pseudo-random number; and

7   scaling all the pixel values in the block as indicated by one parameter in the received

8 film grain information; and

9   storing the created block of film grain into a pool of film grain blocks.

1   8.   The method according to claim 7 wherein the selecting step further comprises the

2 step of selecting from among a predetermined number of sets of 4096 values each.

1   9.   The method according to claim 8 wherein each of the predetermined number of

2 sets of values is arranged as a 512 x 8 matrix.

1   10.   The method according to claim 8 wherein the predetermined number of sets of

2 values are stored in 2's complement and range from [-127, 127].

1   11.   A data carrier containing film grain blocks established in accordance with the

2 method of claim 7 for blending with video information carried by the data carrier.

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1   12.   The method according to claim 11 wherein the data carrier comprises a DVD.

1   13.   Apparatus for creating a block of M x N pixels, comprising,

2   a first storage repository for storing a set of previously established M x N pixel blocks

3   containing film grain, where M and N are integers;

4   a selector for selecting a film grain block of M x N pixels from the first repository as a

5   function of a pseudo-random number; and

6   a scaling block for scaling all the pixel values in the selected film grain block in

7   accordance with at least one parameter of film grain information received by the scaling block;

8   and

9   a second storage repository storing the scaled film grain blocks.

1   14.   The apparatus according to claim 13 wherein the first storage repository stores a

2   predetermined number of sets of 4096 values each.

1   15.   The apparatus according to claim 13 wherein each of the predetermined number of

2   sets of values is arranged as a 512 x 8 matrix.

1   16.   The apparatus according to claim 15 wherein the predetermined number of sets of

2   values are stored in 2's complement and range from [-127, 127].

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1   17.   Apparatus for simulating film grain in an image block of pixel, comprising,

2   a pool of previously established film grain values;

3   a selector for randomly selecting a block of film grain from the pool of pre-established

4   film grain locks for a luma value corresponding to a luma characteristic of the image block;

5   a deblocking filter for deblocking the selected film grain block;

6   an adder for blending at least a portion of the deblocked film grain block with each pixel

7   of the image block to simulate film grain; and

8   a clipper for clipping the resultant blended pixels prior to output.

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